MIL "ON" and/or Rattle Noise from Engine (2AR)

Service Category: Engine/Hybrid System

Section: Engine Mechanical

Market: USA

Applicability

<table>
<thead>
<tr>
<th>YEAR(S)</th>
<th>MODEL(S)</th>
<th>ADDITIONAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 – 2011</td>
<td>Camry</td>
<td>Drive Type(s): 2WD Engine(s): 2AR Transmission(s): 6MT, 6AT VDS(s): BF3EK WMI(s): 4T1, 4T4, JTN</td>
</tr>
<tr>
<td>2009 – 2010</td>
<td>RAV4</td>
<td>Drive Type(s): 4WD, 2WD Engine(s): 2AR Transmission(s): 4AT VDS(s): BF31V, BF32V, BF33V, BF34V, BF35V, BF4DV, DF4DV, EF4DV, JF4DV, KF4DV, RF4DV, WF4DV, XF4DV, YF4DV, ZF31V, ZF32V, ZF33V, ZF34V, ZF35V, ZF4DV WMI(s): 2T3, JTM</td>
</tr>
</tbody>
</table>

TSB REVISION NOTICE

July 28, 2011 Rev1:

- Introduction, Production Change Information, Warranty, and Parts Information has been updated.

Any previous printed versions of this service bulletin should be discarded.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Introduction

Some 2010 – 2011 model year Federal Emissions Specification Camry vehicles and 2009 – 2011 model year RAV4 vehicles equipped with the 2AR-FE engine may exhibit one or more of the following conditions:

- MIL “ON” with DTC P0015 and/or P0017 setting
  - P0015 — Camshaft position “B” – Timing over-retarded (Bank 1)
  - P0017 — Crankshaft position – Camshaft position correlation (Bank 1 Sensor B)
- Rattle noise from the engine

Follow the repair procedure in this bulletin to address this condition.

NOTE
This TSB does NOT apply to 2010–2011 model year California Emissions Specification Camry vehicles.

Production Change Information

This TSB applies to the following vehicles:

- 2011 Federal Emissions Specification Camry vehicles produced BEFORE the Production Change Effective VINs shown below.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PLANT</th>
<th>DRIVETRAIN</th>
<th>PRODUCTION CHANGE EFFECTIVE VIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camry</td>
<td>TMMK Line 1</td>
<td>FWD</td>
<td>4T1BF3EK#BU182097</td>
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<tr>
<td></td>
<td>TMMK Line 2</td>
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<td>4T1BF3EK#BU646187</td>
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<tr>
<td></td>
<td>SIA</td>
<td></td>
<td>4T4BF3EK#BR137403</td>
</tr>
<tr>
<td></td>
<td>Tsutsumi</td>
<td></td>
<td>JTNBF3EK#B3009591</td>
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- All 2009 RAV4 vehicles.
- 2010 RAV4 vehicles produced BEFORE the Production Change Effective VINs shown below.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PLANT</th>
<th>DRIVETRAIN</th>
<th>PRODUCTION CHANGE EFFECTIVE VIN</th>
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<tbody>
<tr>
<td>RAV4</td>
<td>TMMC</td>
<td>2WD</td>
<td>2T3#F###V#AW051643</td>
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<td></td>
<td></td>
<td>4WD</td>
<td>2T3#F###V#AW080481</td>
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<tr>
<td></td>
<td>Tahara</td>
<td>2WD</td>
<td>JTM#F###V#A5031691</td>
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<td></td>
<td></td>
<td>4WD</td>
<td>JTM#F###V#A5036832</td>
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<tr>
<td></td>
<td>Shokki</td>
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<td>JTM#F###V#AD029196</td>
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<tr>
<td></td>
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<td>4WD</td>
<td>JTM#F###V#AD039824</td>
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## Warranty Information

<table>
<thead>
<tr>
<th>OP CODE</th>
<th>DESCRIPTION</th>
<th>MODEL</th>
<th>TIME</th>
<th>OFP</th>
<th>T1</th>
<th>T2</th>
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<tr>
<td>EG1015</td>
<td>R &amp; R Camshaft Timing Exhaust Gear Assembly</td>
<td>Camry</td>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>RAV4</td>
<td>2.4</td>
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<tr>
<td>Combo A</td>
<td>Remove Oil Pan to Replace Additional Components as Needed &amp; Remove Separated Camshaft Timing Exhaust Gear Pieces</td>
<td>Camry</td>
<td>1.8</td>
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<td></td>
<td></td>
<td>RAV4 (2WD, 4WD)</td>
<td>1.9</td>
<td></td>
<td>13070-#####</td>
<td>06</td>
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<td>Combo B</td>
<td>Remove Timing Cover to Replace Additional Components as Needed &amp; Remove Separated Camshaft Timing Exhaust Gear Pieces</td>
<td>Camry</td>
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<td>RAV4 (2WD)</td>
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<td></td>
<td>RAV4 (4WD)</td>
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### APPLICABLE WARRANTY

- This repair is covered under the Toyota Powertrain Warranty. This warranty is in effect for 60 months or 60,000 miles, whichever occurs first, from the vehicle’s in-service date.

- Warranty application is limited to occurrence of the specified condition described in this bulletin.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Parts Information

<table>
<thead>
<tr>
<th>PREVIOUS PART NUMBER</th>
<th>CURRENT PART NUMBER</th>
<th>PART NAME</th>
<th>QTY</th>
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<tbody>
<tr>
<td>13070-0V010</td>
<td>13070-0V013</td>
<td>Gear Assy, Camshaft Timing Exhaust (Federal Emissions Specification ONLY)</td>
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<tr>
<td>13070-0V011</td>
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<td>13070-0V012</td>
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<td>13070-36010</td>
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<td>13070-36011</td>
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<tr>
<td>11213-36020</td>
<td>Same</td>
<td>Gasket, Cylinder Head Cover</td>
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<td>11159-0V010</td>
<td>Same</td>
<td>Gasket, Camshaft Bearing Cap Oil Hole No. 1</td>
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<tr>
<td>90430-A0001</td>
<td>Same</td>
<td>Gasket, Camshaft Bearing Cap Oil Hole No. 2</td>
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<tr>
<td>11328-0V010</td>
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<td>Gasket, Timing Chain Tensioner</td>
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<td>11329-36010</td>
<td>Same</td>
<td>Gasket, Timing Chain Cover, No. 2</td>
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The Following Part Is Only Necessary in the Case of Oil Pan Sub-assembly Removal:

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<th>PART NUMBER</th>
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<tr>
<td>15147-36010</td>
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The Following Parts Are Only Necessary in the Case of Timing Cover Removal:

<table>
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<th>PART NUMBER</th>
<th>QTY</th>
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<tr>
<td>15193-36010</td>
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<td>15197-36010</td>
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<tr>
<td>11496-36010</td>
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Required Tools & Equipment

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<tr>
<th>REQUIRED EQUIPMENT</th>
<th>SUPPLIER</th>
<th>PART NUMBER</th>
<th>QTY</th>
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</thead>
<tbody>
<tr>
<td>TIS Techstream* or Techstream Lite</td>
<td>ADE</td>
<td>TSPKG1 or TSLITEDLR01</td>
<td>1</td>
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NOTE: Software version 5.10.029 or later is required.

<table>
<thead>
<tr>
<th>SPECIAL SERVICE TOOLS (SST)</th>
<th>PART NUMBER</th>
<th>QTY</th>
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<tr>
<td>Torque Wrench Adapter*</td>
<td>09249-63010-01</td>
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Required Tools & Equipment (Continued)

<table>
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<tr>
<th>REQUIRED MATERIAL</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Toyota Genuine Seal Packing Black, Three Bond 1207B, or equivalent</td>
<td>As Needed</td>
</tr>
<tr>
<td>Engine Oil</td>
<td>As Needed</td>
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<tr>
<td>Coolant</td>
<td>As Needed</td>
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</table>

**NOTE**
- Additional Techstream units may be ordered by calling Approved Dealer Equipment (ADE) at 1-800-368-6787.
- Additional SSTs may be ordered by calling 1-800-933-8335.

* Essential SST.

Repair Procedure Overview

1. Remove the camshaft timing exhaust gear assembly.
2. Inspect the gear for separated pieces.
3. Remove the oil pan sub-assembly and timing cover as needed to remove the separated piece(s) and repair/replace additional components as needed.
4. Complete the repair.

Repair Procedure

1. Confirm the customer complaint.
2. Remove the cylinder head cover.
   A. Relocate the engine harness that lies across the top of the cylinder head cover.
   B. Remove the ignition coils.
   C. Remove the 16 bolts and cylinder head cover.

3. Remove the chain tensioner.
   A. Remove the right front wheel.
   B. Remove the front fender apron seal RH.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

C. Remove the V-ribbed belt for the vane pump.

D. Rotate the crankshaft clockwise and set the No. 1 cylinder at +10° from the TDC/compression.

E. After the timing marks are aligned on the VVT gear, place paint marks on the chain and both gears.

F. Rotate the crankshaft counterclockwise by 10° and loosen the tension of the chain.

G. Remove the timing chain cover plate.

H. Align the holes of the stopper plate and tensioner, and insert a pin into the stopper plate hole to lock the tensioner.

I. Remove the 2 bolts and chain tensioner.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

4. Remove the timing chain guide by removing the bolt.

5. Remove the intake side VVT gear.
   A. For Camry ONLY:
      Remove the 2 bolts and the No. 2 timing chain cover (Figure 5).
   B. Remove the service hole plug.
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Repair Procedure (Continued)

C. Insert the tool through the service hole and remove the bolt of the intake VVT gear while holding the camshaft stationary with a wrench.

NOTICE
- Be careful NOT to damage the cylinder head or spark plug tube with the wrench.
- Do NOT disassemble the camshaft timing gear.

D. After the VVT gear is slid in the arrow direction as shown in Figure 8, lower the VVT gear and remove the chain from the VVT gear.

E. Remove the VVT gear from the cam housing.
F. Tie the timing chain to ensure it stays properly aligned with the exhaust and crankshaft timing gear pulleys.

**NOTICE**

The VVT gear bolts may interfere with the housing during removal. After the VVT gear slides out from the camshaft, carefully rotate the VVT gear to the position shown in Figure 9 to avoid interference and remove it in the arrow direction shown.

6. Remove the exhaust camshaft assembly with exhaust VVT gear.

A. Remove the 11 bearing cap bolts in the sequence shown in the illustration.
Repair Procedure (Continued)

B. Using several steps, remove the 10 bearing cap bolts in the sequence shown in the illustration.

Figure 11.

C. Remove the 5 bearing caps.

**HINT**
Arrange the removed bearing caps in order to ensure they are installed in their original locations during reassembly.

D. Remove the exhaust camshaft assembly with camshaft timing exhaust gear.

E. Place additional ties on the timing chain to ensure it stays properly aligned with the crankshaft timing gear pulley.

F. Place the exhaust camshaft with camshaft timing exhaust gear in a vise.

**HINT**
Cover the vise with tape and only apply pressure to one of the hexagonal portions of the camshaft.

G. Remove the bolt and camshaft timing exhaust gear assembly.
H. Inspect the camshaft timing exhaust gear assembly.

Is there a section separated from the gear as shown in Figure 12?

• YES — Go to “Additional Repair Procedure: Part A” in this TSB for removal of the oil pan and, if necessary, the timing cover assembly, to remove the separated piece(s) and perform additional repairs.

• NO — Go to step 7.

7. Install the new camshaft timing exhaust gear assembly.

A. Align and attach the knock pin of the No. 2 camshaft with the pin hole of the camshaft timing exhaust gear.

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Repair Procedure (Continued)

B. Check that there is no clearance between the camshaft timing exhaust gear and camshaft flange.

C. With the exhaust camshaft still secured in the vise, install the bolt.  
   **Torque: 85 N·m (867 kgf·cm, 63 ft·lbf)**

D. Clean the camshaft journals, camshaft housing, and bearing caps.

E. Apply a light coat of engine oil to the camshaft journal, camshaft housing, and bearing caps.

F. Install the exhaust camshaft with new camshaft timing exhaust gear assembly installed.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

8. Install the camshaft bearing cap.

   A. Confirm the marks and numbers on the camshaft bearing caps and place them in their proper positions and directions.

   B. Using several steps, uniformly tighten the 10 bolts in the sequence shown in the illustration.
      Torque: 27 N*m (275 kgf*cm, 20 ft*lbf)

   C. Install the 11 bolts in the order shown in the illustration.
      Torque: 16 N*m (163 kgf*cm, 12 ft*lbf)

      **NOTICE**
      Make sure that the camshaft rotates smoothly after installing the bearing caps.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

9. Install the intake side VVT gear.

A. Confirm the gear is in the unlocked position prior to installation.

**NOTICE**

The camshaft timing gear MUST be in the unlocked position when installing on the camshaft to prevent damage to the lock pin during tightening. Please see step 9D for instructions to unlock the camshaft timing gear.

B. Remove any remaining ties from the timing chain.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

C. Insert the tool from the service hole and install the bolt of the intake VVT gear.

NOTICE
Make sure NOT to lock the camshaft timing gear. If the camshaft timing gear is locked, release the lock according to the following procedure (step 9D).

D. Inspect the camshaft timing gear lock.

If the camshaft timing gear is locked, release the lock according to the following procedure.

(1) After cleaning and degreasing the intake side VVT oil hole on the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown to prevent air from leaking.

NOTICE
Be sure to seal the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.

(2) Make a hole in the adhesive tape covering the oil hole as shown in Figure 20.
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Repair Procedure (Continued)

(3) Apply approximately 200 kPa (2.0 kgf/cm², 29 psi) of air pressure to the hole made in the preceding step, then forcibly turn the camshaft timing gear assembly in the advance direction (counterclockwise).

**CAUTION**
Cover the oil passages with a piece of cloth when applying pressure to keep oil from splashing.

**NOTICE**
- If air leaks out, reattach the adhesive tape.
- Do NOT allow the camshaft timing gear assembly to lock. If it locks, release the lock pin again.

**HINT**
- The camshaft timing gear assembly may be turned in the advance direction without applying any force.
- If enough air pressure cannot be applied because of air leakage from the port, releasing the lock pin may be difficult.

(4) Remove the adhesive tape on the VVT hole.

E. Tighten the bolt of the intake VVT gear.
   Torque: 85 N*m (867 kgf*cm, 63 ft*lbf)

F. Lock the gear by rotating the camshaft timing gear assembly clockwise.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Repair Procedure (Continued)

10. Install the service hole plug with a new gasket.
   Torque: 30 N*m (306 kgf*cm, 22 ft*lbf)

   ![Figure 22. Service Hole Plug]

11. For Camry ONLY:
   Install the No. 2 timing chain cover with the 2 bolts.
   Torque: 10 N*m (102 kgf*cm, 7 ft*lbf)

   ![Figure 23.]

12. Install the timing chain guide with the bolt.
   Torque: 21 N*m (214 kgf*cm, 15 ft*lbf)

   ![Figure 24.]
13. Install the chain to the VVT gear.

NOTICE
Align the marks that were placed on the gears and chain.

14. Install the chain tensioner.
   A. Install the chain tensioner to the service hole.
      Torque: 10 N·m (102 kgf·cm, 7 ft·lb)
   B. When installing the tensioner, pull out the pin and release the tensioner.
   C. Install the timing chain cover plate.
      Install a new gasket and the timing chain cover plate with the 4 bolts.
      Torque: 10 N·m (102 kgf·cm, 7 ft·lb)

15. Install the cylinder head cover sub-assembly.
   A. Apply a light coat of engine oil to 3 new gaskets.
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Repair Procedure (Continued)

B. Install the 3 gaskets to the camshaft bearing caps.

C. Install a new gasket to the cylinder head cover.

NOTICE
Remove any oil from the contact surface.

D. Apply seal packing as shown.

Seal Packing: Toyota Genuine Seal Packing Black, Three Bond 1207B, or equivalent
Standard Seal Diameter: 3.0 to 6.0 mm (0.118 to 0.236 in.)
Application Width A: 5.0 mm (0.197 in.)

NOTICE
- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Seal Packing</td>
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<tr>
<td>2</td>
<td>Timing Chain Cover</td>
</tr>
<tr>
<td>3</td>
<td>Camshaft Housing</td>
</tr>
<tr>
<td>4</td>
<td>3.0 to 6.0 mm</td>
</tr>
<tr>
<td>A</td>
<td>Application Width “A”</td>
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</tbody>
</table>
E. Align the cylinder head cover with pin A. Then align the cylinder head cover with pin B and install the cylinder head cover.

F. Install the 16 bolts and then tighten the bolts in the order shown in Figure 29. Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

**NOTICE**
Do NOT fill the engine with oil or start and run the vehicle for at LEAST 4 hours after the installation.

G. Confirm proper engine and coolant levels prior to starting the engine and test driving the vehicle.

H. Clear DTCs with Techstream.

16. Confirm the repair.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Additional Repair Procedure: Part A

Remove the oil pan sub-assembly to remove the separated piece(s) of the camshaft timing exhaust gear and repair/replace additional components as needed.

Removal

1. Remove the oil pan sub-assembly.

   A. Remove the 11 bolts and 2 nuts.

   B. Insert the blade of an oil pan seal cutter between the oil pan and stiffening crankcase, cut off the applied sealer, and remove the oil pan.

   **NOTICE**
   - Be careful NOT to damage the stiffening crankcase contact surface of the oil pan.
   - Be careful NOT to damage the stiffening crankcase flange.
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Additional Repair Procedure: Part A

Removal (Continued)

2. Remove the oil strainer sub-assembly by removing the 3 bolts, oil strainer, and gasket.

3. Remove the No. 1 oil pan baffle plate by removing the 5 bolts.

4. Remove the separated piece(s) of the camshaft timing exhaust gear assembly.

5. Clean the oil pan sub-assembly and related components prior to reassembly.
MIL "ON" and/or Rattle Noise from Engine (2AR)

Additional Repair Procedure: Part A (Continued)

Installation

1. Install the No. 1 oil pan baffle plate.

   Install the oil pan baffle plate and uniformly tighten the 5 bolts in several steps, in the sequence shown in the illustration.
   
   Torque: 10 N*m (102 kgf*cm, 7 ft*lbf)

2. Install the oil strainer sub-assembly.

   A. Apply a light coat of engine oil to a new gasket.

   B. Align the protrusion of the gasket with the cutout of the oil strainer, and install the gasket to the oil strainer.

   C. Install the oil strainer with the 3 bolts in several steps, in the sequence shown in the illustration.

   Torque: 10 N*m (102 kgf*cm, 7 ft*lbf)
MIL "ON" and/or Rattle Noise from Engine (2AR)

Additional Repair Procedure: Part A

Installation (Continued)

3. Install the oil pan sub-assembly.

A. Apply seal packing in a continuous line as shown in the illustration.

Seal Packing: Toyota Genuine Seal Packing
Black, Three Bond 1207B, or equivalent
Standard Seal Diameter: 2.5 to 3.5 mm (0.0984 to 0.138 in.)

NOTICE

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes and tighten the bolts and nuts within 10 minutes after applying seal packing.
- Do NOT apply oil for at least 4 hours after the installation.

4. Install the oil pan with the 11 bolts and 2 nuts in several steps, in the sequence shown in the illustration.

Torque: 10 N*m (102 kgf*cm, 7 ft*lbf)

HINT

Bolt A and nut B are tightened twice.

5. Were all the separated pieces of the camshaft timing exhaust gear found?

- YES — Go to “Repair Procedure”, step 7.
- NO — Go to “Additional Repair Procedure: Part B”.

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Additional Repair Procedure: Part B

1. Remove the timing chain cover to remove the separated piece(s) of the camshaft timing exhaust gear and repair/replace additional components as needed.

Refer to the Technical Information System (TIS), applicable model and model year Repair Manual:

- **2009 RAV4:**

- **2010 RAV4:**

- **2010 Camry:**

- **2011 Camry:**

2. Go to “Repair Procedure”, step 7, to complete the repair.